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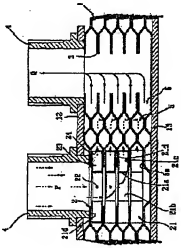
(54) PLATE TYPE HEAT EXCHANGER

(57)Abstract:
PROBLEM TO BE SOLVED: To improve remarkably and surely the total heat transfer performance of a refrigerant in two-phase flow of gas and liquid in a fluid flow passage for the refrigerant between laminated heat transfer plates.
SOLUTION: In a heat exchanger, hollow members 21 are fixed to the inlet flow passages 5a of fluid flow passages 5 for refrigerant which are formed between a plurality of heat transfer plates 1 to conduct the refrigerant P of two-phase flow of gas and liquid to flow into the fluid passages 5 through the hollow members 21. The refrigerant P is introduced into an internal space 23 from the fore stage small holes 22 of inner wall parts 21a of the hollow members 21 after choking the same to evacuate and expand the same. In this case, an initial uniform distribution of gas phase and liquid phase of the refrigerant P as well as the subdivision of the gas phase are effected, then, the uniform distribution of the gas phase and the liquid phase as well as the subdivision of the gas phase are effected when the refrigerant P is passed from the internal space 23 into the rear stage small holes 23 of an external wall part 21b to introduce the same into the fluid flow passages 5, whereby the total heat transfer performance of the refrigerant P in the fluid flow passages 5 is improved surely.



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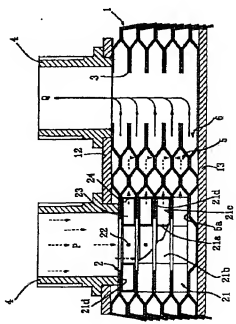
ＤＤ５５

(54)【発明の名称】　プレート式熱交換器

(57)【要約】
【課題】　積層された伝熱プレート間の冷媒用流体流路における気液二相流の冷媒のトータルの伝熱性能を顕著に確実に向上させる。
【解決手段】　複数の伝熱プレート１の間に形成された冷媒用流体流路５の入口流路５ａに中空部材２１を固設して、中空部材２１を通して気液二相流の冷媒Ｐを流体流路５に流出させる熱交換器で、中空部材２１の内壁部２１ａの前段小孔２２から冷媒Ｐを絞って内部空間２３に流入させて減圧膨張させ、このときに初回の冷媒Ｐの気相と液相の均一分配と気相の細分化を行い、内部空間２３から外壁部２１ｂの後段小孔２３に冷媒Ｐを通過させて流体流路５に流出させるときも気相液相の均一分配と気相の細分化を行うようにして、冷媒Ｐの流体流路５におけるトータル伝熱性能を確実に向上させる。



【特許請求の範囲】

【請求項１】 積層された複数の伝熱プレートの間に、一方が気液二相流冷媒である２種の流体が流通して熱交換が行われる流体流路を交互に形成し、伝熱プレートに形成した冷媒の入口用通路孔周辺の入口流路から冷媒用流体流路に冷媒を流入させるプレート式熱交換器において、

冷媒用流体流路の入口流路に、外部からの気液二相流冷媒がその流れが絞られて流入し拡散して流出する前段小孔、及び、この前段小孔を流出した冷媒が減圧膨張する内部空間、及び、この内部空間で減圧膨張した冷媒がその流れが絞られて流入し拡散して流出する後段小孔を有する中空部材を配置し、この中空部材の後段小孔から冷媒用流体流路に冷媒を流入させることを特徴とするプレート式熱交換器。

【請求項２】 中空部材が円筒状の小径の内壁部とこの内壁部より大径の外壁部を有するリング状で、内壁部に前段小孔を、外壁部に後段小孔を、内壁部と外壁部の間に内部空間を形成したことを特徴とする請求項１記載のプレート式熱交換器。

【請求項３】 中空部材を隣接する伝熱プレートでろう材を介して挟持させて、伝熱プレート間にろう付け固定したことを特徴とする請求項１又は２記載のプレート式熱交換器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、複数枚の伝熱プレートをろう付け等で積層一体化したプレート式熱交換器に関する。

【０００２】

【従来の技術】冷凍機のフロン等の冷媒は、蒸発器の熱交換器から１００％気体となって圧縮機から凝縮器に送られて温度上昇した液体となり、この液体が膨張弁で体積膨張して急激に温度低下した液相（液体）と気相（気泡）の混合した気液二相流となって蒸発器の熱交換器に送られる循環サイクルで恒久的に利用される。このような冷凍機の冷媒の蒸発器に用いられる熱交換器は、複数枚の伝熱プレートを積層一体化したプレート式熱交換器が一般的であり、その基本構造例を図７及び図８に示し、これを改変した熱交換器を図９及び図１０で説明する。

【０００３】図７に示される熱交換器は、複数枚の伝熱プレート１と２枚の金属フレーム１２，１３をろう材（図示せず）を介し積層して、高温・真空下でろう付け（ブレージング）したブレージング式熱交換器である。伝熱プレート１と金属フレーム１２，１３はステンレス製の略矩形板で、各伝熱プレート１の４隅部に熱交換されるべき２種の流体の通路孔２，３が形成され、一方の金属フレーム１２の４隅部に２種の流体の出入口となるノズル４が貫通させてろう付けされる。

【０００４】伝熱プレート１は波板プレートの熱交換伝熱部１ａと、熱交換伝熱部１ａの周縁部を折曲した縁立て部１ｂを有し、隣接する伝熱プレート１の縁立て部１ｂが気密にろう材で溶融接合される。複数の伝熱プレート１を積層一体化したとき、各々の熱交換伝熱部１ａの４隅に形成された通路孔２，３が同心に対向して連通する。また、複数の伝熱プレート１を積層一体化したとき、図８に示すように各伝熱プレート１間に一方が冷媒である２種の流体が流通する流体流路５，６が交互に形成される。図８は１種の流体である気液二相流の冷媒Ｐの入口側と他の１種の流体Ｑの出口側の断面が示され、冷媒用流体流路５の冷媒用通路孔２の周辺部通路が冷媒用入口流路５ａである。冷媒用入口流路５ａは、隣接する伝熱プレート１の相互にろう付けされた入口側通路孔２の周辺部で囲まれたリング状の空間部分で、冷媒用入口側通路孔２と連通するノズル４も外部から流入した冷媒Ｐは、入口側通路孔２から入口流路５ａに入り、入口流路５ａから流体流路５を流通して隣りの流体流路６を流通する他の流体Ｑを冷却する。

【０００５】冷媒用流体流路５の入口流路５ａに流入する冷媒Ｐは、図示しない凝縮器で凝縮された液体を膨張弁で膨張させて急冷させた液相と気相の気液二相流冷媒であり、この気液二相流冷媒の液相と気相が分裂と合体を繰り返して流体流路５を流れる。流体流路５を流れる冷媒Ｐのトータル伝熱性能を高く確保するため、入口流路５ａから流体流路５に入る冷媒Ｐの気相と液相の均一分配と、熱伝導率の悪い泡状の気相の細分化が促進されるように、入口流路５ａの形状やサイズが設計される。しかし、隣接する伝熱プレート１間の狭間だけの入口流路５ａでは冷媒Ｐが単に通過するだけであるので気相と液相の均一分配や気相の細分化を促進する機能に劣り、１つの流体流路５における冷媒Ｐのトータル伝熱性能が低くならざるを得ない。そこで、この低い伝熱性能を見越して伝熱プレート１の枚数を増やし、冷媒用流体流路５の数を増やして冷媒のトータルの低伝熱性能をカバーするようにしているが、これでは熱交換器が大型化し、コスト高となる。

【０００６】熱交換器の気液二相流冷媒Ｐのトータルの低伝熱性能を伝熱プレート数を増大させることなくカバーするため、例えば図９に示すプレート式熱交換器では、冷媒用入口流路５ａに図１０に示すような厚板の金属リング１４を固設している。金属リング１４はステンレス、銅あるいは鉄製の厚板で、内周面から外周面に貫通させて１条のトンネル孔１５を有する。金属リング１４の内径は伝熱プレート１の冷媒用通路孔２と同一か、それよりも小さく、外径は通路孔２より大きい。金属リング１４は隣接する伝熱プレート１間に挟持され、通路孔２と同心に位置決めして固定される。トンネル孔１５は、気液二相流の冷媒Ｐが絞られて流入し、拡散して流出する内径２ｍｍ程度の小孔である。

【０００７】図９の熱交換器においては、冷媒用入口調通路孔２に流入した気液二相流冷媒Ｐが金属リング１４の内周のトンネル孔入口に絞られて流入し、トンネル孔１５を流動して金属リング１４外周のトンネル孔出口から拡散流出して冷媒用流体通路５を流動する。このように気液二相流の冷媒Ｐが小孔のトンネル孔１５を通過する間に、気液二相流の冷媒Ｐの比較的大きな粒径の気相（気泡）が小さな粒状に細分化され、かつ、気相と液相の流れが絞られ拡散されることで均一分配化されるようにして、冷媒用流体通路５を流れる際の冷媒Ｐのトータル伝熱性能が高くなるようにしてある。

【０００８】

【発明が解決しようとする課題】図９の熱交換器は、金属リング１４による気液二相流冷媒Ｐの均一分配、気相の細分化の性能が良ければ、冷媒Ｐのトータル伝熱性能が上がって伝熱プレート数を少なくして熱交換器の小型・低コスト化が実現されるのであるが、未だ金属リング１４による顕著な性能改善が果たされていないのが現状である。その要因として、金属リング１４の１箇所のトンネル孔１５に気液二相流冷媒Ｐを通過させるだけでは気相の細分化が不十分であり、不均一で大きな気相が流体流路５を流れる可能性が大であり、このことがトータル伝熱性能の顕著な改善を難しくしている。また、金属リング１４のトンネル孔１５の内径を細小したり、トンネル孔数を増やして、トータル伝熱性能の改善策とすることも行われているが、その改善効果が不十分であって、伝熱プレート数を少なくして熱交換器の小型・低コスト化を実現させることが難しいのが現状である。

【０００９】本発明は図９の熱交換器の問題点に鑑みてなされたもので、その目的とするところは、気液二相流冷媒のトータル伝熱性能を顕著に確実に改善し得たプレート式熱交換器を提供することにある。

【００１０】

【課題を解決するための手段】本発明の上記目的を達成する請求項１の発明は、積層された複数の伝熱プレートの間に、一方が気液二相流冷媒である２種の流体が流通して熱交換が行われる流体流路を交互に形成し、伝熱プレートに形成した冷媒の入口用通路孔周辺の入口流路から冷媒用流体流路に冷媒を流入させるプレート式熱交換器において、冷媒用流体流路の入口流路に、外部からの気液二相流冷媒がその流れが絞られて流入し拡散して流出する前段小孔、及び、この前段小孔を流出した冷媒が減圧膨張する内部空間、及び、この内部空間で減圧膨張した冷媒がその流れが絞られて流入し拡散して流出する後段小孔を有する中空部材を配置し、この中空部材の後段小孔から冷媒用流体流路に冷媒を流入させることを特徴とする。

【００１１】ここで、中空部材は冷媒用流体流路の入口流路を囲むリング状等の金属箱、金属容器で、伝熱プレートにろう付けや溶接等で固定される。この中空部材は、冷媒流れに対して上流側に前段小孔を下流側に後段小孔を有し、この前後段の小孔の間に内部空間が形成されて、気液二相流の冷媒は前段小孔から内部空間を通って最終的に後段小孔から流体流路に流出して行く。中空部材の前段と後段の各小孔は単一孔、或いは、複数孔が可能であり、これら小孔の内径、孔中心線の角度も任意で有り、熱交換器の種類に応じて適宜に設定される。また、中空部材の内部空間は単一空間、或いは、仕切壁で流体流れ方向直列に仕切られた複数空間であってもよく、この複数空間の場合は複数空間を仕切る仕切壁に中間的な小孔を形成して複数空間に冷媒を順に流すようにする。気液二相流の冷媒が複数の小孔を絞られて流通し、さらに、小孔から内部空間に減圧膨張して流出するといった異なる形態の冷媒流通が複数回に亘り段階的、繰り返し的に行われることで、気液二相流冷媒の最終的な気相と液相の均一分配、気相の細分化が確実に顕著に行われる。

【００１２】本発明の請求項２の発明は、中空部材が円筒状の小径の内壁部とこの内壁部より大径の外壁部を有するリング状で、内壁部に前段小孔を、外壁部に後段小孔を、内壁部と外壁部の間に内部空間を形成したことを特徴とする。このリング状中空部材の外形は従来の金属リングと同様なもので、隣接する伝熱プレートの冷媒入口流路孔の周辺部に挟持された形で固設される。伝熱プレートの冷媒入口流路孔に流入した冷媒がリング状中空部材の内壁部の中を通過する間に冷媒の一部が前段小孔に流入する。

【００１３】本発明の請求項３の発明は、中空部材を隣接する伝熱プレートでろう材を介して挟持させて、伝熱プレート間にろう付け固定したことを特徴とする。このように中空部材を伝熱プレートにろう付けするようにすると、複数の伝熱プレートをろう付けするプレージング式熱交換器の製作時に、複数の伝熱プレートのろう付けと同一工程で中空部材のろう付けができて、熱交換器の製作が工程的、コスト的に有利に実施される。

【００１４】

【発明の実施の形態】以下、本発明の実施形態を図１乃至図６を参照して詳述する。なお、この実施形態は図８や図９の熱交換器に適用したもので、図１乃至図６の図７乃至図９と同一、又は、相当部分には同一参照符号を付して、その詳細説明は省略する。

【００１５】図１に示される第１の実施形態の熱交換器はプレージング式のプレート式熱交換器で、複数の伝熱プレート１の間に形成された複数の冷媒用流体流路５の入口流路５ａの各々に中空部材２１を固設している。中空部材２１は図３に示すようなリング状のステンレス等の金属製品で、円筒状の内壁部２１ａと外壁部２１ｂを有し、内壁部２１ａの例えば１箇所に前段小孔２２が、外壁部２１ｂの１箇所に後段小孔２４が形成され、内壁部２１ａと外壁部２１ｂの間に密閉状の内部空間２３が

形成される。前後段の各小孔２２，２４は、気液二相流の冷媒Ｐが絞られて流通する内径２ｍｍ程度の貫通孔である。

【００１６】図１及び図３に示される中空部材２１は、その内壁部２１ａが伝熱プレート１の冷媒用入口流路孔２の内径より小さな円筒状であり、外壁部２１ｂが入口流路孔２の内径より大きな円筒状であり、内壁部２１ａと外壁部２１ｂの下端がリング状底板部２１ｃで一体に連結される。この内壁部２１ａと外壁部２１ｂと底板部２１ｃで構成される上端開口リング状容器は、プレス加工や切削加工で製作され、このリング状容器の上端開口を金属のリング状蓋板２１ｄで密閉することで中空部材２１が構成される。蓋板２１ｄは、気液二相流の冷媒Ｐが前段小孔２２を通らず直接に内部空間２３に流入するのを阻止する空間密閉蓋であり、このような要は図２の第２の実施形態においては不必要で省略してあり、その理由は後述する。

【００１７】リング状中空部材２１は、隣接する伝熱プレート１の冷媒用入口流路孔２の周辺部に入口流路孔２の中心線と内壁部２１ａの中心線がほぼ一致するように位置決めされて固定、例えばろう付けにて固定される。このように中空部材２１を伝熱プレート１にろう付けすると、伝熱プレート同士をろう付けするプレージング式熱交換器の製作時に伝熱プレート同士のろう付けと中空部材２１のろう付けが１工程で実行できて、プレージング式熱交換器の製作が工程的、コスト的に有利となる。冷媒用入口流路５ａにリング状中空部材２１は、その後段小孔２４を冷媒用流体流路５の方向に向けて固定される。この中空部材２１の前段小孔２２の方向性は限定されないが、図３に示すように後段小孔２４に対して９０°の定方向に位置するようにしてある。

【００１８】複数の伝熱プレート１間の複数の冷媒用入口流路５ａに複数のリング状中空部材２１を固定して、冷媒入口ノズル４から気液二相流冷媒Ｐを流入させると、冷媒Ｐは各リング状中空部材２１の内壁部２１ａ内周面を軸方向に流動し、一部の冷媒Ｐが内壁部２１ａの前段小孔２２に絞られて内部空間２３へと流入する。この冷媒流入は、図５に示すように行われる。内壁部２１ａの外を流動する気液二相流の冷媒Ｐは、図５の実線矢印の概念図で示される液相Ｐ１と図５の粒子概念図で示される気相（気泡）Ｐ２であり、気相Ｐ２の粒径が比較的大きく、仮にこれをそのまま冷媒用流体流路５に流入させると伝熱性能が低下するが、本発明においてはまず液相Ｐ１と気相Ｐを前段小孔２２から内部空間２３に流入させる。前段小孔２２に絞径の大きな気相Ｐ２が通過するとき、絞られて小粒径化されると共に、前段小孔２２から内部空間２３に流出するときに減圧膨張するため、内部空間２３では気相Ｐ２と液相Ｐ１が均一分配され、気相Ｐ２のほとんどが小粒子状に細分化される。

【００１９】さらに、前段小孔２２から内部空間２３に流入した冷媒Ｐは、図３（Ｂ）に示すようにリング状の内部空間２３を流動して、最終的に後段小孔２４に絞られて流入して冷媒用流体流路５に流出して行く。冷媒Ｐが後段小孔２４を通過する段階においても気相液相の均一分配と気相細分化が行われる。この後段小孔２４による気相細分化は、前段小孔２２から内部空間２３に流動した比較的大きな中粒子の気相や、内部空間２３を流動する短時間の間に合体した中粒子の気相が小粒子状に細分されることである。

【００２０】以上のように中空部材２１で気液二相流冷媒Ｐは、前後２段の小孔２２，２４による２段階に亘る気相液相の均一分配及び気相細分化と、前段小孔２２から内部空間２３への流出と後段小孔２４から流体流路５の空間への流出による２段階に亘る減圧膨張の作用で、確実かつ顕著に気相液相の均一分配と気相細分化が行われて流体流路５を流通する。そのため、１つの流体流路５における冷媒Ｐのトータル伝熱性能が確実に向上し、伝熱プレート数を少なくして熱交換器を小型化して、低コストで製作することが可能となる。

【００２１】図６は、図１の熱交換器を冷凍機の冷媒循環システムに適用したときの概略図で、凝縮器（図示せず）から送られてくる冷媒Ｐは液相Ｐ１が主流であり、これが膨張弁３０で液相Ｐ１と気相Ｐ２の気液二相流冷媒Ｐとなって熱交換器に送られ、内部の中空部材２１に達する。この冷媒Ｐが複数の中空部材２１の内壁部２１ａの前段小孔２２から内部空間２３に流入し、外壁部２１ｂの後段小孔２４から流出して流体流路５を流動する。この場合、十分に気相液相が均一分配され気相Ｐ２が細分化された気液二相流の冷媒Ｐが伝熱プレート１間の流体流路５を流れるため、高効率の熱交換が行われて高度な冷凍サイクルが実現される。熱交換器を出た冷媒Ｐは、ほとんどが気相成分となって後続の圧縮機へと送られ、圧縮機から凝縮器、膨張弁に送られて熱交換器に戻る。

【００２２】図２に示される第２の実施形態の熱交換器は、上記中空部材２１の構造変更例を示すもので、図２における中空部材２１’は図４に示すような蓋無しの上端開口有底のリング状金属容器である。この中空部材２１’は、円筒状の内壁部２１ａと外壁部２１ｂとリング状の底板部２１ｃだけで構成され、内壁部２１ａの１箇所に前段小孔２２が外壁部２１ｂの１箇所に後段小孔２４が形成され、内壁部２１ａと外壁部２１ｂの間が内部空間２４となる。

【００２３】図２の中空部材２１’は、これが図示された冷媒入口流路５ａの形状寸法に対応させたもので、この場合の冷媒入口流路５ａの冷媒用通路孔２の内径より中空部材２１’の内壁部２１ａの内径が大きめに設定してある。したがって、蓋無しの中空部材２１’を冷媒入口流路５ａに位置決めして固定すると、中空部材２１７の上端開口が伝熱プレート１の通路孔２の周辺部で塞が

れて内部空間２３が略密閉空間となるので、この中空部材２１'は蓋板を必要としない。このような蓋無し中空部材２１'の気液二相流冷媒Ｐに対する気相液相均一分散化や気相細分化の機能は、図３の蓋有り中空部材２１と同様ゆえに説明は省略する。

【００２４】以上の各実施形態において中空部材をリング状としたが、これはリング状の冷媒用入口流路に対応させたもので、冷媒用入口流路の形状に応じた任意の形状とすることができ、たとえば半円弧状の中空部材等であってもよい。また、中空部材の内壁部の１箇所に前段小孔を、外壁部の１箇所に後段小孔を形成したが、これら各小孔の個数、大きさ、形状、形成位置は特定されない。また、中空部材の内壁部と外壁部の間に１つの内部空間を形成するようにしたが、この内部空間を複数に仕切って、仕切られた複数の空間を冷媒が順に減圧膨張して流動するようにしてもよい。

【００２５】さらに、本発明は、プレージング式熱交換器以外のガスケットシール式のアレート式熱交換器等にも有効に適用されるものであり、例えばガスケットシール式熱交換器においては中空部材を伝熱プレートに溶接で固定、或いは、ガスケットを介して伝熱プレートに圧接して固定するようにすればよい。

【００２６】

【発明の効果】請求項１と２の発明によれば、気液二相流の冷媒が中空部材の前段小孔、内部空間、後段小孔を順に通過し、この通過時に少なくとも２段階に亘って気相液相の均一分配と気相の細分化が行われて冷媒用流体流路に流出するので、流体流路における冷媒の気相液相均一分配と気相細分化が十分顕著に実行されて、冷媒のトータル伝熱性能が向上し、熱交換効率に優れたプレート式熱交換器が提供できる。また、冷媒のトータル伝熱性能の改善により、伝熱プレート数を少なくして熱交換器を小型軽量にし、製作コストを低減させることが容易になる。

【００２７】請求項３の発明によれば、隣接する伝熱プレート間に中空部材をろう付けで固定することで、複数の伝熱プレートを同時にろう付けするプレージング式熱交換器が１工程のろう付けで製作でき、また、ガスケット等の特別な別部材を使用すること無く中空部材を既存の伝熱プレートに既存のろう付け方法で固定することができて、製作時に有利なプレート式熱交換器が提供できる。

【図面の簡単な説明】

【図１】本発明の第１の実施形態を示すプレート式熱交換器の要部の断面図。

【図２】本発明の第２の実施形態を示すプレート式熱交換器の要部の断面図。

【図３】（Ａ）は図１熱交換器における中空部材の断面図、（Ｂ）はＴ１－Ｔ１線の断面図。

【図４】図２熱交換器における中空部材の断面図。

【図５】図３の中空部材による気液二相流冷媒の均一分配・細分化現象を説明するための模式的断面図。

【図６】本発明の熱交換器を主体とする冷凍機の冷媒循環システムの一部概要を示す模式図。

【図７】（Ａ）は従来のプレート式熱交換器の一部省略部分を含む正面図、（Ｂ）は側面図。

【図８】図７（Ａ）のＴ２－Ｔ２線の拡大断面図。

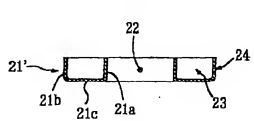
【図９】図８の熱交換器の改変例を示す他の従来の熱交換器の断面図。

【図１０】図９の熱交換器に使用される金属リングの平面図。

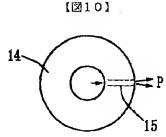
【符号の説明】

Ｐ　気液二相流冷媒
Ｑ　流体
１　伝熱プレート
２　冷媒用通路孔
５　冷媒用流体流路
５ａ　冷媒用入口流路
６　流体流路
２１　中空部材
２１'　中空部材
２１ａ　内壁部
２１ｂ　外壁部
２２　前段小孔
２３　内部空間
２４　後段小孔

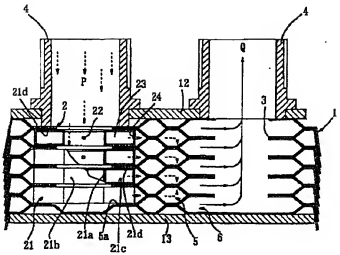
【図４】



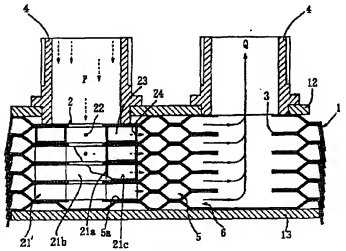
【図１０】



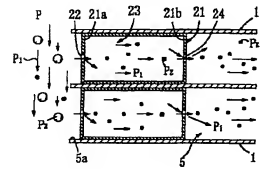
【図1】


4
4
Q
P
23
12
21d
2
22
24
3
1
21
21b
21a
5a
21c
21d
13
5
6

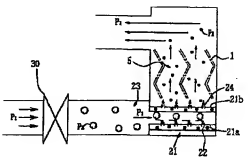
【図2】


4
4
Q
F
23
24
12
2
22
3
1
21'
21b
21a
5a
21c
5
6
13

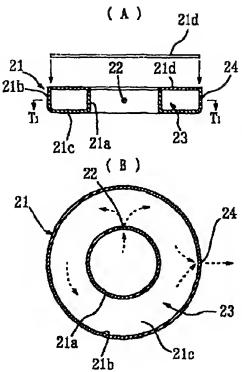
【図5】


P
22
21a
23
21b
21
24
1
P1
P2
5a
5

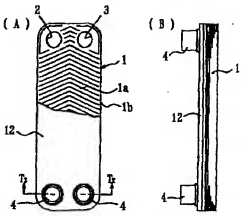
【図6】


P1
h
5
1
30
23
24
21b
h
P2
21
22
21a

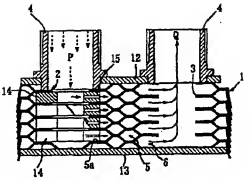
【図3】


(A)
21d
21
22
21d
24
21b
T1
T1
21c
21a
23
(B)
22
21
24
23
21a
21b
21c

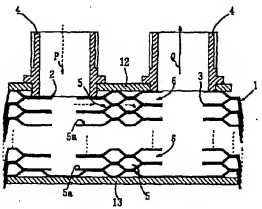
【図7】


(A)
2
3
1
1a
1b
12
T2
T2
4
4
(B)
4
1
12
4

【図9】


4
4
P
Q
15
12
2
3
1
14
5a
13
5
6

【図8】


4
4
P
Q
12
2
5
6
3
1
5a
6
5a
13
5

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the plate type heat exchanger which carried out the laminating unification of two or more heat transfer plates by soldering etc.
[0002]
[Description of the Prior Art] Refrigerants, such as chlorofluocarbon of a refrigerator, serve as a gas from the heat exchanger of an evaporator 100%, serve as a liquid which sent and carried out the temperature rise to the condenser from a compressor, and are everlastingly used in the circulation cycle in which this liquid serves as vapor-liquid two-phases flow which the liquid phase (liquid) which carried out cubical expansion and carried out the temperature fall rapidly by the expansion valve, and a gaseous phase (air bubbles) mixed, and is sent to the heat exchanger of an evaporator. The heat exchanger used for the evaporator of the refrigerant of such a refrigerator has the common plate type heat exchanger which carried out the laminating unification of two or more heat transfer plates, the example of basic structure is shown in drawing 7 and drawing 8 , and drawing 9 and drawing 10 explain the heat exchanger which changed this.
[0003] The heat exchanger shown in drawing 7 is a blazing type heat exchanger which carried out the laminating of the two metal frames 12 and 13 to two or more heat transfer plates 1 through wax material (not shown), and was soldered under the elevated temperature and the vacuum (blazing). The heat transfer plate 1 and the metal frames 12 and 13 are the abbreviation rectangle plates made from stainless steel, and the path holes 2 and 3 of two sorts of fluids by which heat exchange should be carried out are formed in four corners of each heat transfer plate 1, the nozzle 4 used as the entrance of two sorts of fluids makes four corners of one metal frame 12 penetrate, and they are soldered.
[0004] The heat transfer plate 1 has ******** 1b which bent the periphery section of heat exchange heat transfer section 1a of a corrugated plate plate, and heat exchange heat transfer section 1a, and fused junction of the ******** 1b of the adjoining heat transfer plate 1 is airtightly carried out by wax material. When the laminating unification of two or more heat transfer plates 1 is carried out, the path holes 2 and 3 formed in four corners of each heat exchange heat transfer section 1a counter this alignment, and are open for free passage. Moreover, when the laminating unification of two or more heat transfer plates 1 is carried out, as shown in drawing 8 , the fluid passage 5 and 6 where two sorts of fluids whose one side is refrigerants circulate is formed by turns between each heat transfer plate 1. The cross section of the entrance side of the refrigerant P of the vapor-liquid two-phases flow whose drawing 8 is one sort of fluids, and the outlet side of one sort of other fluids Q is shown, and the periphery path of the path hole 2 for refrigerants of the fluid passage 5 for refrigerants is inlet-port passage 5for refrigerants a. Inlet-port passage 5a for refrigerants is the space part of the shape of a ring surrounded by the periphery of the entrance-side path hole 2 soldered at both the adjoining heat transfer plates 1. The entrance-side path hole 2 for refrigerants and the refrigerant P which flowed into the nozzle 4 open for free passage from the outside go into inlet-port passage 5a from the entrance-side path hole 2, and cools other fluids Q which circulate the fluid passage 5 from inlet-port passage 5a, and circulate the next fluid passage 6.
[0005] The refrigerant P which flows into inlet-port passage 5a of the fluid passage 5 for refrigerants is a vapor-liquid two-phases flow refrigerant of the liquid phase and a gaseous phase which the liquid condensed with the condenser which is not illustrated was expanded by the expansion valve, and was made to quench it, and the liquid phase and the gaseous phase of this vapor-liquid two-phases flow refrigerant repeat fission and coalesce, and it flows the fluid passage 5. In order to secure highly the total heat transfer engine performance of the refrigerant P which flows the fluid passage 5, the configuration

and size of inlet-port passage 5a are designed so that fragmentation of the homogeneity distribution of the gaseous phase of Refrigerant P and the liquid phase which go into the fluid passage 5 from inlet-port passage 5a, and the gaseous phase of the shape of a bubble with bad thermal conductivity may be promoted. However, in inlet-port passage 5a of only the clearance between the adjoining heat transfer plates 1, since Refrigerant P only passes, it cannot but be inferior to the function which promotes homogeneity distribution of a gaseous phase and the liquid phase, and fragmentation of a gaseous phase, and the total heat transfer engine performance of the refrigerant P in one fluid passage 5 cannot but become low. Then, although foresee this low heat transfer engine performance, the number of sheets of the heat transfer plate 1 is increased, the number of the fluid passage 5 for refrigerants is increased and he is trying to cover the total low heat transfer engine performance of a refrigerant, now, a heat exchanger is enlarged and it becomes cost quantity.

[0006] Since the total low heat transfer engine performance of the vapor-liquid two-phases flow refrigerant P of a heat exchanger is covered without increasing the number of heat transfer plates, in the plate type heat exchanger shown in drawing 9 , the metal ring 14 of a thick plate as shown in inlet-port passage 5a for refrigerants at drawing 10 is fixed. A metal ring 14 is stainless steel, copper, or an iron thick plate, and a peripheral face is made to penetrate from inner skin, and it has the tunnel hole 15 of one articles. The bore of a metal ring 14 is the same as that of the path hole 2 for refrigerants of the heat transfer plate 1, or is smaller than it, and an outer diameter is larger than the path hole 2. A metal ring 14 is pinched between the adjoining heat transfer plates 1, and is positioned and fixed to the path hole 2 and this alignment. The tunnel hole 15 is a stoma with a bore of about 2mm which the refrigerant P of vapor-liquid two-phases flow is extracted, flows, and spreads and flows out.

[0007] In the heat exchanger of drawing 9 , it is extracted to the tunnel hole inlet port of the inner circumference of a metal ring 14, and flows, and the vapor-liquid two-phases flow refrigerant P which flowed into the entrance-side path hole 2 for refrigerants flows, carries out the diffusion outflow of the tunnel hole 15 from the tunnel hole outlet of metal ring 14 periphery, and flows the fluid channel 5 for refrigerants. Thus, while the refrigerant P of vapor-liquid two-phases flow passes the tunnel hole 15 of a stoma, it is made for the total heat transfer engine performance of the refrigerant P at the time of flowing the fluid channel 5 for refrigerants to become high as the gaseous phase (air bubbles) of a comparatively big particle size of the refrigerant P of vapor-liquid two-phases flow is formed into homogeneity distribution by the small thing which it is subdivided granular and done for the rat tail diffusion of the flow of a gaseous phase and the liquid phase.

[0008]

[Problem(s) to be Solved by the Invention] Although the total heat transfer engine performance of Refrigerant P will be improved, the number of heat transfer plates will be lessened and small and low cost-ization of a heat exchanger will be realized if the heat exchanger of drawing 9 has homogeneity distribution of the vapor-liquid two-phases flow refrigerant P by the metal ring 14, and the good engine performance of fragmentation of a gaseous phase, the present condition is that the remarkable engine-performance improvement by the metal ring 14 is not yet achieved. As for fragmentation of a gaseous phase, as the factor, it is inadequate for one tunnel hole 15 of a metal ring 14 just to pass the vapor-liquid two-phases flow refrigerant P, possibility that an uneven and big gaseous phase will flow the fluid passage 5 is size, and this makes difficult the remarkable improvement of the total heat transfer engine performance. Moreover, although reducing the bore of the tunnel hole 15 of a metal ring 14, or increasing the number of tunnel holes, and considering as the remedy of the total heat transfer engine performance is also performed, it is difficult for the present condition for the improvement effect to be insufficient, and to lessen the number of heat transfer plates and to realize small and low cost-ization of a heat exchanger.

[0009] This invention was made in view of the trouble of the heat exchanger of drawing 9 , and the place made into the purpose is to offer the plate type heat exchanger which has improved notably the total heat transfer engine performance of a vapor-liquid two-phases flow refrigerant certainly.

[0010]

[Means for Solving the Problem] Invention of claim 1 which attains the above-mentioned purpose of this invention The fluid passage where two sorts of fluids whose one side is vapor-liquid two-phases flow refrigerants circulate, and heat exchange is performed among two or more heat transfer plates by which the laminating was carried out is formed by turns. In the plate type heat exchanger which makes a refrigerant flow into the fluid passage for refrigerants from the inlet-port passage of the path hole circumference for inlet ports of the refrigerant formed in the heat transfer plate The preceding paragraph stoma out of which the flow is extracted to the inlet-port passage of the fluid passage for refrigerants, and the vapor-liquid two-phases flow refrigerant from the outside flows into it, and spreads and flows into it,

and the building envelope where the refrigerant which flowed out carries out reduced pressure expansion of this preceding paragraph stoma -- and That flow is extracted, and the refrigerant which carried out reduced pressure expansion in this building envelope arranges the centrum material which has the latter-part stoma which flows, and spreads and flows out, and is characterized by making a refrigerant flow into the fluid passage for refrigerants from the latter-part stoma of this centrum material.

[0011] Here, centrum material is metal boxes, such as the shape of a ring which takes up the inlet-port passage of the fluid passage for refrigerants, and a metal vessel, and is fixed to a heat transfer plate by soldering, welding, etc. To refrigerant flow, it has a preceding paragraph stoma in the upstream, it has a latter-part stoma in the downstream, as for this centrum material, a building envelope is formed between the stomata of an order [this] stage, and, finally the refrigerant of vapor-liquid two-phases flow flows out and goes to fluid passage from a latter-part stoma through a building envelope from a preceding paragraph stoma. A single hole or two or more holes are possible for each stoma of the preceding paragraph of centrum material, and the latter part, and the bore of these stomata and its include angle of a hole center line are also arbitrary, there is, and it is suitably set up according to the class of heat exchanger. Moreover, the building envelope of centrum material may be single space or two or more space which were divided into the fluid flow direction serial with the bridge wall, in the case of these two or more space, an in-between stoma is formed in the bridge wall which divides two or more space, and it pours a refrigerant in order to two or more space. Homogeneity distribution of the final gaseous phase and the liquid phase of a vapor-liquid two-phases flow refrigerant and fragmentation of a gaseous phase are notably ensured by the refrigerant of vapor-liquid two-phases flow having two or more stomata extracted, and circulating, and refrigerant circulation of a different gestalt of carrying out reduced pressure expansion and flowing out of a stoma into a building envelope covering multiple times further, and being carried out gradually and in repeat.

[0012] Centrum material has the shape of a ring which has the outer wall section of a major diameter from cylinder-like the wall section and this wall section of a minor diameter, and invention of claim 2 of this invention is characterized by forming [a preceding paragraph stoma] a building envelope in the wall section for a latter-part stoma between the wall section and the outer wall section in the outer wall section. The appearance of this ring-like centrum material is the same as that of the conventional metal ring, and is fixed in the form pinched by the periphery of the refrigerant inlet-port passage hole of an adjoining heat transfer plate. While the refrigerant which flowed into the refrigerant inlet-port passage hole of a heat transfer plate passes through the inside of the wall section of ring-like centrum material, some refrigerants flow into a preceding paragraph stoma.

[0013] Invention of claim 3 of this invention makes centrum material pinch through wax material on an adjoining heat transfer plate, and is characterized by carrying out soldering immobilization between heat transfer plates. Thus, if centrum material is soldered on a heat transfer plate, at the time of manufacture of the blazing type heat exchanger which solders two or more heat transfer plates, at the same process as soldering of two or more heat transfer plates, soldering of centrum material can be performed and manufacture of a heat exchanger will be carried out in favor of a process cost target.

[0014]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained in full detail with reference to drawing 1 thru/or drawing 6 . In addition, this operation gestalt is what was applied to the heat exchanger of drawing 8 or drawing 9 , the same reference mark is given to drawing 7 of drawing 1 thru/or drawing 6 thru/or drawing 9 , the same, or a considerable part, and that detail explanation is omitted.

[0015] The heat exchanger of the 1st operation gestalt shown in drawing 1 is a plate type heat exchanger of a blazing type, and fixes the centrum material 21 to each of inlet-port passage 5a of two or more fluid passage 5 for refrigerants formed among two or more heat transfer plates 1. The centrum material 21 is metal goods, such as stainless steel of the shape of a ring as shown in drawing 3 , it has cylinder-like wall section 21a and outer wall section 21b, and the preceding paragraph stoma 22 is formed in one place of wall section 21a, the latter-part stoma 24 is formed in one place of outer wall section 21b, and the building envelope 23 of the letter of sealing is formed between wall section 21a and outer wall section 21b. Each stomata 22 and 24 of an order stage are through tubes with a bore of about 2mm which the refrigerant P of vapor-liquid two-phases flow is extracted, and circulates.

[0016] the centrum material 21 shown in drawing 1 and drawing 3 -- among those, wall 21a is smaller than the bore of the inlet-port passage hole 2 for refrigerants of the heat transfer plate 1 -- it is cylindrical and outer wall section 21b is bigger than the bore of the inlet-port passage hole 2 -- it is cylindrical and the lower limit of wall section 21a and outer wall section 21b is connected with one by ring-like bottom

plate section 21c. The centrum material 21 consists of the upper limit opening ring-like container which consists of this wall section 21a, outer wall section 21b, and bottom plate section 21c being manufactured by press working of sheet metal or cutting, and sealing upper limit opening of this ring-like container by 21d of metaled ring-like cover plates. 21d of cover plates is the space sealing lid which prevents that the refrigerant P of vapor-liquid two-phases flow does not pass along the preceding paragraph stoma 22, but flows into a building envelope 23 directly, and they are unnecessary for such a lid in the 2nd operation gestalt of drawing 2 , are omitted, and mention the reason later.

[0017] The ring-like centrum material 21 is positioned so that the center line of the inlet-port passage hole 2 and the center line of wall section 21a may be mostly in agreement with the periphery of the inlet-port passage hole 2 for refrigerants of the adjoining heat transfer plate 1, and it is fixed by immobilization, for example, soldering. Thus, if the centrum material 21 is soldered on the heat transfer plate 1, soldering of heat transfer plates and soldering of the centrum material 21 can perform at one process at the time of manufacture of the blazing type heat exchanger which solders heat transfer plates, and will become advantageous [manufacture of a blazing type heat exchanger / process] in cost at it. The ring-like centrum material 21 turns the latter-part stoma 24 in the direction of the fluid passage 5 for refrigerants, and is fixed to inlet-port passage 5a for refrigerants. Although the directivity of the preceding paragraph stoma 22 of this centrum material 21 is not limited, it is made to be located in the 90-degree constant direction to the latter-part stoma 24, as shown in drawing 3 .

[0018] If two or more ring-like centrum material 21 is fixed to two or more inlet-port passage 5a for refrigerants between two or more heat transfer plates 1 and the vapor-liquid two-phases flow refrigerant P is made to flow from the refrigerant inlet-port nozzle 4, the wall section 21a inner skin of each ring-like centrum material 21 will be flowed to shaft orientations, some refrigerants P will be extracted to the preceding paragraph stoma 22 of wall section 21a, and Refrigerant P will flow into a building envelope 23. This refrigerant inflow is performed as shown in drawing 5 . Although the refrigerant P of the vapor-liquid two-phases flow which flows the outside of wall section 21a is the gaseous phase (air bubbles) P2 shown by the particle conceptual diagram of the liquid phase P1 shown by the conceptual diagram of the continuous-line arrow head of drawing 5 , and drawing 5 , its particle size of a gaseous phase P2 is comparatively large, and the heat transfer engine performance will fall if this is made to flow into the fluid passage 5 for refrigerants as it is temporarily The liquid phase P1 and a gaseous phase P are made to flow into a building envelope 23 from the preceding paragraph stoma 22 first in this invention. In order to carry out reduced pressure expansion when flowing out of the preceding paragraph stoma 22 into a building envelope 23 while being extracted and diameter[of a granule]-ized, when the gaseous phase P2 with a big particle size passes to the preceding paragraph stoma 22, in a building envelope 23, a gaseous phase P2 and the liquid phase P1 are formed into homogeneity distribution, and most gaseous phases P2 are subdivided in the shape of a granule child.

[0019] Furthermore, the refrigerant P which flowed into the building envelope 23 from the preceding paragraph stoma 22 flows the ring-like building envelope 23, as shown in drawing 3 (B), finally it is extracted to the latter-part stoma 24, flows, and flows out and goes to the fluid passage 5 for refrigerants. Also in the phase where Refrigerant P passes the latter-part stoma 24, the formation of homogeneity distribution and gaseous-phase fragmentation of the gaseous-phase liquid phase are performed. The gaseous-phase fragmentation by this latter-part stoma 24 is that the gaseous phase of a particle while [comparatively big] flowing from the preceding paragraph stoma 22 to the building envelope 23, and the gaseous phase of a particle while coalescing between the short time which flows a building envelope 23 are subdivided in the shape of a granule child.

[0020] As mentioned above, by the centrum material 21, the vapor-liquid two-phases flow refrigerant P is an operation of the reduced pressure expansion covering two steps by the homogeneity distribution of the gaseous-phase liquid phase and the gaseous-phase fragmentation covering two steps by two steps of stomata 22 and 24, the outflow to a building envelope 23 from the preceding paragraph stoma 22, and the outflow to the space of the fluid passage 5 from the latter-part stoma 24 approximately, and homogeneity distribution and gaseous-phase fragmentation of the gaseous-phase liquid phase are performed certainly and notably, and it circulates the fluid passage 5. Therefore, it improves certainly, and the total heat transfer engine performance of the refrigerant P in one fluid passage 5 lessens the number of heat transfer plates, miniaturizes a heat exchanger, and turns into that manufacturing by low cost is possible.

[0021] The refrigerant P which drawing 6 is a schematic diagram when applying the heat exchanger of drawing 1 to the refrigerant circulation system of a refrigerator, and is sent from a condenser (not shown) has the liquid phase P1 in use, this serves as the vapor-liquid two-phases flow refrigerant P of the liquid phase P1 and a gaseous phase P2 by the expansion valve 30, and is sent to a heat exchanger, and reaches

the internal centrum material 21. This refrigerant P flows into a building envelope 23 from the preceding paragraph stoma 22 of wall section 21a of two or more centrum material 21, flows out of the latter-part stoma 24 of outer wall section 21b, and flows the fluid passage 5. In this case, in order that the refrigerant P of vapor-liquid two-phases flow with which the homogeneity distribution of the gaseous-phase liquid phase were fully carried out, and the gaseous phase P2 was subdivided may flow the fluid passage 5 between the heat transfer plates 1, efficient heat exchange is performed and an advanced refrigerating cycle is realized. Most serves as a gaseous-phase component, and the refrigerant P which came out of the heat exchanger is sent to a consecutive compressor, is sent to a condenser and an expansion valve from a compressor, and returns to a heat exchanger.

[0022] The heat exchanger of the 2nd operation gestalt shown in drawing 2 shows the example of a structural change of the above-mentioned centrum material 21, and centrum material 21' in drawing 2 is the ring-like metal vessel of an upper limit opening owner bottom without a lid as shown in drawing 4 . This centrum material 21' consists of only cylinder-like wall section 21a, outer wall section 21b, and ring-like bottom plate section 21c, the preceding paragraph stoma 22 is formed in one place of wall section 21a, the latter-part stoma 24 is formed in one place of outer wall section 21b, and between wall section 21a and outer wall section 21b turns into a building envelope 24.

[0023] Centrum material 21' of drawing 2 was made to correspond to the geometry of refrigerant inlet-port passage 5a to which this is fixed, and the bore of wall section 21a of centrum material 21' is more greatly set up from the bore of the path hole 2 for refrigerants of refrigerant inlet-port passage 5a in this case. Therefore, if centrum material 21' without a lid is positioned to refrigerant inlet-port passage 5a and it fixes, since upper limit opening of the centrum material 217 will be closed by the periphery of the path hole 2 of the heat transfer plate 1 and a building envelope 23 will turn into an abbreviation closed space, this centrum material 21' does not need a cover plate. The function of the gaseous-phase liquid phase homogeneity decentralization to the vapor-liquid two-phases flow refrigerant P of such lid-less centrum material 21' or gaseous-phase fragmentation omits explanation like the centrum material 21 with a lid of drawing 3 therefore.

[0024] Although centrum material was made into the shape of a ring in each above operation gestalt, this could be made to correspond to the ring-like inlet-port passage for refrigerants, and can be made into the configuration of the arbitration according to the configuration of the inlet-port passage for refrigerants, for example, may be the centrum material of a semicircle arc etc. Moreover, although the preceding paragraph stoma was formed in one place of the wall section of centrum material and the latter-part stoma was formed in one place of the outer wall section, the number of each [these] stoma, magnitude, a configuration, and a formation location are not pinpointed. Moreover, although one building envelope was formed between the wall section of centrum material, and the outer wall section, a refrigerant carries out reduced pressure expansion of two or more space where the batch was divided into plurality in this building envelope at order, and you may make it flow.

[0025] Furthermore, this invention is applied effective in the plate type heat exchanger of gasket seal types other than a blazing type heat exchanger etc., carries out the pressure welding of the centrum material to a heat transfer plate through immobilization or a gasket at a heat transfer plate in a gasket seal type heat exchanger by welding, and should just fix it.

[0026]

[Effect of the Invention] According to invention of claims 1 and 2, the refrigerant of vapor-liquid two-phases flow The preceding paragraph stoma of centrum material, Since a building envelope and a latter-part stoma are passed in order, homogeneity distribution of the gaseous-phase liquid phase and fragmentation of a gaseous phase are performed to at least two steps for the time of this passage and it flows into the fluid passage for refrigerants The gaseous-phase liquid phase homogeneity distribution and the gaseous-phase fragmentation of a refrigerant in fluid passage are performed sufficiently notably, the total heat transfer engine performance of a refrigerant improves, and the plate type heat exchanger excellent in heat exchange effectiveness can be offered. Moreover, it becomes easy to lessen the number of heat transfer plates, to make a heat exchanger into a small light weight, and to reduce manufacture cost by improvement of the total heat transfer engine performance of a refrigerant.

[0027] According to invention of claim 3, by fixing centrum material by soldering between adjoining heat transfer plates, centrum material can be fixed to the existing heat transfer plate by the existing soldering approach, without the blazing type heat exchanger soldered to coincidence being able to manufacture two or more heat transfer plates by soldering of one process, and using another member with a special gasket etc., and the advantageous plate type heat exchanger in manufacture can be offered.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The sectional view of the important section of a plate type heat exchanger showing the 1st operation gestalt of this invention.
[Drawing 2] The sectional view of the important section of a plate type heat exchanger showing the 2nd operation gestalt of this invention.
[Drawing 3] For (A), the sectional view of the centrum material in the drawing 1 heat exchanger and (B) are the sectional view of T1-T1 line.
[Drawing 4] The sectional view of the centrum material in the drawing 2 heat exchanger.
[Drawing 5] The typical sectional view for explaining homogeneity distribution / fragmentation phenomenon of the vapor-liquid two-phases flow refrigerant by the centrum material of drawing 3 .
[Drawing 6] The refrigerant circulation system of the refrigerator which makes the heat exchanger of this invention a subject is the mimetic diagram showing an outline a part.
[Drawing 7] (A) is a front view of the conventional plate type heat exchanger which contains an abbreviation part in part, and (B) is a side elevation.
[Drawing 8] The expanded sectional view of T2-T2 line of drawing 7 (A).
[Drawing 9] The sectional view of other conventional heat exchangers showing the example of an alteration of the heat exchanger of drawing 8 .
[Drawing 10] The top view of the metal ring used for the heat exchanger of drawing 9 .
[Description of Notations]
P Vapor-liquid two-phases flow refrigerant
Q Fluid
1 Heat Transfer Plate
2 Path Hole for Refrigerants
5 Fluid Passage for Refrigerants
5a Inlet-port passage for refrigerants
6 Fluid Passage
21 Centrum Material
21' Centrum material
21a Wall section
21b Outer wall section
22 Preceding Paragraph Stoma
23 Building Envelope
24 Latter-Part Stoma

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CLAIMS

[Claim(s)]
[Claim 1] The fluid passage where two sorts of fluids whose one side is vapor-liquid two-phases flow refrigerants circulate, and heat exchange is performed among two or more heat transfer plates by which the laminating was carried out is formed by turns. In the plate type heat exchanger which makes a refrigerant flow into the fluid passage for refrigerants from the inlet-port passage of the path hole circumference for inlet ports of the refrigerant formed in the heat transfer plate The preceding paragraph stoma out of which the flow is extracted to the inlet-port passage of the fluid passage for refrigerants, and the vapor-liquid two-phases flow refrigerant from the outside flows into it, and spreads and flows into it, and the building envelope where the refrigerant which flowed out carries out reduced pressure expansion of this preceding paragraph stoma -- and The plate type heat exchanger to which the refrigerant which carried out reduced pressure expansion in this building envelope is characterized by extracting that flow, arranging the centrum material which has the latter-part stoma which flows, and spreads and flows out, and making a refrigerant flow into the fluid passage for refrigerants from the latter-part stoma of this centrum material.
[Claim 2] centrum material -- the wall section of a cylinder-like minor diameter -- among these, the plate type heat exchanger according to claim 1 characterized by forming [a preceding paragraph stoma] a building envelope for a latter-part stoma between the wall section and the outer wall section in the wall section at the outer wall section by the shape of a ring which has the outer wall section of a major diameter from a wall.
[Claim 3] The plate type heat exchanger according to claim 1 or 2 characterized by having made centrum material pinch through wax material on an adjoining heat transfer plate, and carrying out soldering immobilization between heat transfer plates.

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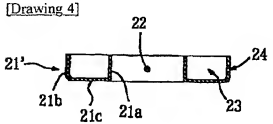
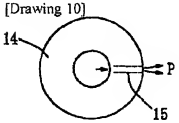
DRAWINGS

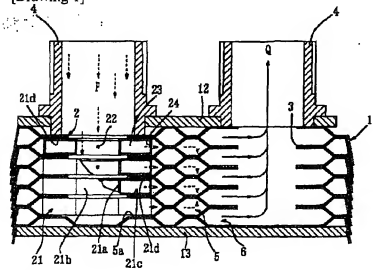
[Drawing 4]



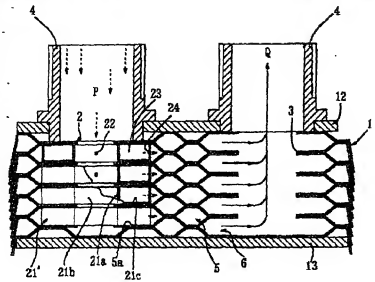
[Drawing 10]



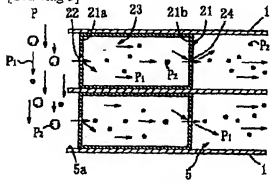
[Drawing 1]



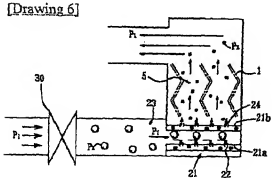
[Drawing 2]



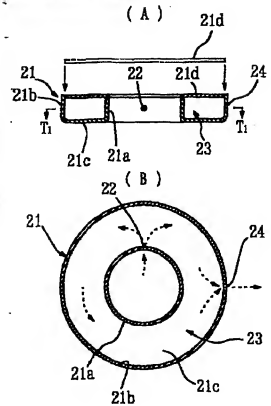
[Drawing 5]



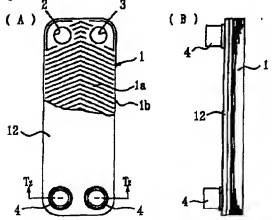
[Drawing 6]



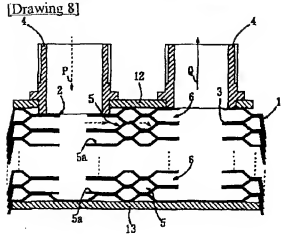
[Drawing 3]



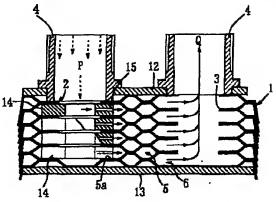
[Drawing 7]



[Drawing 8]



[Drawing 9]



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